

HAIR BLEACHING AND COLOURING COMPOSITIONSFIELD OF THE INVENTION

- 5 This invention relates to hair bleaching and colouring compositions and methods of bleaching and colouring hair.

BACKGROUND OF THE INVENTION

- 10 Hair contains the pigment melanin in granular form within the hair cortex. The darker the perceived hair colour, the higher the concentration of melanin in the hair. Chemical and natural dyes may also be applied to hair to alter the perceived hair colour. The objective of hair bleaching
- 15 compositions is to decolourise both the naturally occurring melanin pigment and in addition any synthetic pigments applied to the hair. Hair colouring compositions generally contain agents first to decolourise the hair and dyes subsequently to colour the decolourised hair.
- 20 Hair bleaching and colouring treatment of hair is generally associated with a number of disadvantages such as causing hair brittleness and damage.
- 25 Damage to the hair typically manifests itself in cuticle and protein loss from the hair fibre, excessive fibre stiffness, hair fibre brittleness and breakage and frayed or split ends.
- 30 Solutions to the problem of hair damage caused by hair bleaching and colouring compositions have been suggested in the art. WO 98/27945 describes the use a low pH (pH 1 to 6) oxidative hair dye system to reduce hair damage. JP 63-297317 describes the optional use of cholesterol in a hair
- 35 dye composition to improve the strength and feel of hair.

In general, the darker the hair the higher the pH required in order effectively to decolourise the higher concentration of melanin pigment. Unfortunately these necessarily harsh  
5 conditions in order to deliver effective bleaching and colouring can be particularly damaging to the hair.

Thusfar hair bleaching and colouring compositions have been unable to fully satisfy the desire for effective bleaching  
10 with minimal hair damage, particularly for dark-brown and black hair.

Hair bleaching and/or colouring compositions which can deliver effective hair bleaching and/or colouring, even on  
15 dark hair, but which avoid or reduce hair damage and deliver improved damage repair and protection to the hair thus continue to be sought.

We have now found that if hair bleaching and colouring  
20 compositions are buffered to a pH above pH 10, the presence of cholesterol reduces damage, protects hair from damage and/ or improves damage repair to a greater extent than in such compositions having a pH below pH 10. Such compositions are advantageous since they can deliver effective bleaching  
25 and colouring of dark hair whilst the damage generally caused by such high pH systems is reduced by a surprising extent.

Hair bleaching and colouring compositions according to the  
30 present invention demonstrate improved efficacy in the repair and prevention of the principal symptoms of damaged hair.

SUMMARY OF THE INVENTION

According to a first aspect of the present invention there is provided a hair bleaching composition comprising:

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- (a) a peroxygen compound;
- (b) a buffering agent; and
- (c) cholesterol and/or derivatives thereof or mixtures thereof;

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characterised in that the pH of the composition is greater than pH 10.

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According to a second aspect of the present invention there is provided a hair colouring composition comprising the hair bleaching composition according to the first aspect and additionally a hair colouring agent.

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According to a third aspect of the present invention there is provided a method of bleaching and/or colouring hair comprising applying to the hair the bleaching composition and/or colouring composition according to the first and/or second aspects of the invention.

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According to a further aspect of the present invention there is provided a hair bleaching kit comprising:

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- (a) a first package containing a peroxygen compound;
- (b) a second package containing a buffering agent; and
- (c) cholesterol and/or derivatives thereof or mixtures thereof contained in the first and/or second package and/or in a third package;

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characterised in that the peroxygen compound, buffering agent and cholesterol and/or derivatives thereof or

mixtures thereof form, when mixed, a hair bleaching composition according to the first aspect of the present invention having a pH greater than 10.

5 According to a still further aspect of the present invention there is provided a hair colouring kit comprising:

- (a) a first package containing a peroxygen compound;
- (b) a second package containing a buffering agent;
- 10 (c) cholesterol and/or derivatives thereof or mixtures thereof contained in the first and/or second package and/or in a third package; and
- (d) a hair colouring agent contained in the second package and/or third package, and/or a fourth
- 15 package;

characterised in that the peroxygen compound, buffering agent, hair colouring agent and cholesterol and/or derivatives thereof or mixtures thereof form, when mixed, a

20 hair colouring composition according to the second aspect of the invention having a pH greater than 10.

A still further aspect of the present invention provides a method of bleaching and/or colouring hair using the hair

25 bleaching and/or colouring kit described above comprising the steps of admixing the contents of the packages followed by applying the bleaching and/or colouring composition to the hair.

30 DETAILED DESCRIPTION

PEROXYGEN COMPOUND

The compositions of the invention comprise as an essential

35 feature at least one peroxygen compound. Mixtures of two or

more such compounds may be used if desired. The peroxygen compounds bleach hair by solubilising and oxidising melanin.

Hydrogen peroxide is the most preferred peroxygen compound for use in the bleaching and colouring compositions of the present invention, though many other peroxygen compounds are suitable.

Other peroxygen compounds suitable for use are generally water soluble peroxygen compounds such as peroxygen bleaches capable of yielding hydrogen peroxide in aqueous solution. Water soluble in this respect means a peroxygen compound which can be substantially solubilised in water at 25°C. Water soluble peroxygen bleaching compounds are well known in the art and, other than hydrogen peroxide, include inorganic alkali metal peroxides such as sodium peroxide and sodium peroxide, organic peroxides such as urea peroxide and melamine peroxide and inorganic perhydrate salt bleaching compounds such as the alkali metal salts of perborates, percarbonates, perphosphates, persilicates, persulphates and the like.

The peroxygen compound is generally present in the compositions of the present invention at a level from 0.01% to 40%, preferably from 0.1% to 20%, most preferably from 1% to 7%, by weight of the composition.

#### BUFFERING AGENT AND pH OF THE COMPOSITIONS

The pH of the bleaching and colouring compositions of the present invention are buffered such that they are greater than pH 10. A wide variety of buffering agents well known in the art are suitable for this purpose.

The most preferred buffering agent is an aqueous alkaline solution containing ammonia (ammonium hydroxide). Ammonia has the advantage of enhancing the bleaching and colouring treatment of hair by swelling the hair fibre to aid

5 diffusion of peroxygen compounds into the hair. This allows faster and more effective solubilisation and decolouration of melanin or synthetic hair dyes.

Other suitable buffering agents include ethylamine,  
10 dipropylamine, triethylamine and alkanediamines such as 1,3-diaminopropane, anhydrous alkaline alkanolamines such as, mono or di- ethanolamine, hydroxides of alkali metals, such as sodium and potassium hydroxide, hydroxides of alkali earth metals, such as magnesium and calcium hydroxide, basic  
15 amino acids such as L-alanine, lysine, oxylysine and histidine and alkanolamines such as dimethylaminoethanol and aminoalkylpropanediol and mixtures thereof.

It is an essential feature of the present invention that the  
20 compositions are buffered to a pH which is greater than pH 10. In a preferred embodiment the pH of the compositions are buffered to a pH which is greater than or equal to pH 10.1, more preferably greater than or equal to pH 10.3, and most preferably greater than or equal to pH 10.5.

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A sufficient amount of buffering agent is present in the compositions of the present invention in order to buffer the compositions to the required pH in conventional manner.

30 We have now found that in hair bleaching and colouring compositions which are buffered to a pH above pH 10, cholesterol reduces damage, protects hair from damage and/or improves damage repair to a greater extent than in such compositions having a pH below pH 10. Such compositions are  
35 advantageous since they can deliver effective bleaching and

colouring of dark hair whilst the damage generally caused by such high pH systems is reduced by a surprising extent.

#### CHOLESTEROL

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A further essential component of the bleaching and colouring compositions of the present invention is cholesterol.

Derivatives of cholesterol such as cholesterol esters, cholesterol fatty acid esters, and cholesterol acetate

10 esters are also suitable for use in the compositions of the present invention.

The level of cholesterol or derivatives in the composition is suitably from 0.005% to 5%, preferably from 0.001% to 3%,  
15 optimally from 0.01% to 0.1%, by weight based on the total weight of the composition.

#### HAIR COLOURING AGENTS

20 The hair colouring compositions of the present invention additionally include one or more hair colouring agents. Hair colouring agents suitable for use in the compositions of the present invention include both oxidative and non-oxidative dyes and mixtures thereof. Such hair  
25 colouring agents may be used with the bleaching systems of the present invention to formulate permanent, demi-permanent, semi-permanent or temporary hair dye compositions.

30 (i) Oxidative Dyes

The dye forming intermediates used in oxidative dyes are generally classified as primary and secondary intermediates.

Primary intermediates are chemical compounds which by themselves will form a dye upon oxidation. The secondary intermediates, also known as colour modifiers or couplers are used with other intermediates for specific colour effects or to stabilise the colour.

Primary oxidative dye intermediates are generally colourless molecules prior to oxidation. The oxidative dye colour is generated when the primary intermediate is oxidised and subsequently enjoined with a secondary intermediate (coupling agent), which is also generally colourless, to form a coloured, conjugated molecule.

Oxidative dye intermediates diffuse into the hair shaft, and then are oxidised and coupled to form larger dye complexes within the hair shaft which are less readily washed out thus forming a "permanent" hair colour change.

The secondary intermediates (colour modifiers or couplers), are preferably used in conjunction with the oxidative dye precursors and are thought to interpose themselves in the coloured polymers during their formation and to cause shifts in the electronic spectra thereof, thereby resulting in slight colour changes.

A wide range of oxidative dyes suitable for use herein are well known in the art, such as aromatic diamines, amino phenols, polyhydric phenols and derivatives thereof. Preferred oxidative dyes for use in the present invention include m-phenylenediamine, toluene-2,5-diamine, p-phenylenediamine, resorcinol, o-aminophenol, m-aminophenol, p-aminophenol, 1-naphthol, 4-amino-2-hydroxytoluene, 2-methylresorcinol, N4, N4-bishydroxyethyl-p-phenylene diamine sulphate, 3-methyl-4-aminophenol, 1-phenyl-3-methyl-pyrazolone and 2-methyl-5-hydroxyethylaminophenol.



## (ii) Non-oxidative Dyes

Non-oxidative dyes include direct dyes, semi-permanent,  
5 temporary and other dyes. Various types of non-oxidative  
dyes are well known in the art.

Natural dyes and vegetable dyes may also be included in the  
colouring compositions of the present invention. Examples  
10 include henna, camomile, indigo, logwood and walnut hull  
extract.

Temporary hair dyes, or hair colouring rinses, are generally  
comprised of dye molecules which are too large to diffuse  
15 into the hair shaft and which act on the exterior of the  
hair. They are usually applied via a leave- in procedure in  
which the dye solution is allowed to dry on the hair  
surface.

20 Semi-permanent hair dyes are generally larger than permanent  
(oxidative) dyes. Typically, semi-permanent dyes act in a  
similar manner to oxidative dyes in that they have the  
potential to diffuse into the hair shaft. However, semi-  
permanent dyes are generally smaller in size than the  
25 aforementioned conjugated oxidative dye molecules and as  
such are pre-disposed to gradual diffusion out of the hair  
again. Simple hair washing and cleaning action will  
encourage this process. Suitable semi-permanent dyes for use  
in the compositions of the present invention include HC Blue  
30 2, HC Yellow 4, HC Red 3, Disperse Violet 4, Disperse Black  
9, HC Blue 7, HC Yellow 2, Disperse Blue 3, Disperse violet  
I and mixtures thereof.

Direct dyes, such as nitro dyes do not require oxidation to  
35 dye the hair. They are usually applied to the hair in a

base formulation which includes surfactant material.  
Suitable direct dyes include derivatives of nitroamino  
benzene, nitro aryl amines or azo dyes.

5 OPTIONAL MATERIALS AND COSMETIC ADJUNCT

Besides the actives, the compositions of the present  
invention may also contain other ingredients conventionally  
used in the art such as diluents, sequestrants, thickeners,  
10 carriers, surfactants (anionic, cationic, nonionic,  
amphoteric, zwitterionic and mixtures thereof),  
antioxidants, proteins, polypeptides, preservatives,  
moisturising agents, solvents, perfumes, enzymes, polymers  
and conditioners.

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PRODUCT FORM

The compositions according to the present invention may be  
presented in kit form comprising a number of separate  
20 compartments containing the various ingredients of the final  
composition for mixing by the user immediately prior to  
application to the hair. The kit may comprise multiple  
containers or a single container having multiple  
compartments.

25

One component of the kit comprises an individually packaged  
peroxygen compound. A further kit component comprises an  
individually packaged buffering agent. In one embodiment of  
the present invention the individually packaged peroxygen  
30 compound comprises a stabilised aqueous solution of a water-  
soluble peroxygen bleach compound, most generally hydrogen  
peroxide in an amount such that the final concentration of  
the compound for use on the hair is from 0.5% to 14% by  
weight of the composition, and the individually packaged  
35 buffering agent comprises ammonium hydroxide in an amount

such that the pH of the composition once mixed is greater than pH10. The cholesterol (or derivatives) may be contained in the peroxygen compound compartment or the buffering agent compartment, or indeed in a further separate compartment.

- 5 Optionally a hair colouring agent (for hair colouring compositions) and/or additional agents as herein before described may also be included in with the buffering agent compartment, cholesterol compartment (if present) or indeed in a still further separate compartment.

10

Most conveniently the kit comprises two separate compartments, one containing the peroxygen compound, the other containing the buffering agent and hair colouring agent (if present) and the other optional ingredients

- 15 mentioned above; the cholesterol being present in either or both of those two compartments.

The compartmentalised ingredients of the composition are generally mixed by the user immediately prior to application to the hair.

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#### METHOD OF USE

- 25 The compositions of the present invention may be used to bleach hair or may, in combination with hair colouring agents, be used to bleach and colour hair.

The bleaching/colouring compositions herein are applied to the hair for periods of from 1 minute to 90 minutes depending upon the degree of bleaching/colouring required. A preferred time is between 5 minutes and 30 minutes.

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The products provide excellent hair bleaching and/or hair colouring together with minimal hair damage.

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EXAMPLESExample 1

- 5 This example demonstrates the hair damage reduction provided by cholesterol in hair bleaching compositions at various pHs.

**Step 1: Preparation of the Test bleaching Solutions.**

- 10 Two bleaching solutions, Solution 1 without cholesterol (as a control) and Solution 2 with cholesterol, were prepared in the following manner:

**Bleaching Solution 1 (No Cholestrol)**

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| Material                        | %Active Species | %w/w         | Amount (g) |
|---------------------------------|-----------------|--------------|------------|
| SLES 2EO<br>(Tegobetain CK)     | 25.94           | 8.00         | 30.84      |
| CAPB<br>(Tegobetain CK)         | 30              | 4.00         | 13.33      |
| Dequest                         | 100             | 0.20         | 0.20       |
| Hydrogen Peroxide<br>(ex Sigma) | 30              | 4.00         | 13.33      |
| Water (DI)                      |                 |              | 42.29      |
|                                 |                 | <b>Total</b> | 100.00     |

Bleaching Solution 2 (With Cholesterol)

| Material                               | %Active Species | %w/w         | Amount (g) |
|--|-----------------|--------------|------------|
| SLES 2EO<br>(Tegobetain CK)            | 25.94           | 8.00         | 30.84      |
| CAPB<br>(Tegobetain CK)                | 30              | 4.00         | 13.33      |
| Cholesterol<br>(ex Sigma) <sup>a</sup> | 100             | 0.01         | 0.01       |
| Dequest                                | 100             | 0.20         | 0.20       |
| Hydrogen Peroxide<br>(ex Sigma)        | 30              | 4.00         | 13.33      |
| Water (DI)                             |                 |              | 42.28      |
|  |                 | <b>Total</b> | 100.00     |

5 For the bleaching solution with cholesterol, Solution 2,  
first the dequest was weighted into the water in a tall form  
beaker and allowed to dissolve. Once dissolved the  
cholesterol and a small amount of SLES 2EO (approximately  
1g) were weighted into the dequest solution and heated in a  
10 waterbath to 70°C with continuous stirring using the small  
cog of a heidolph stirrer. The solution was left to stir  
and cool to approximately 35-40°C for at least an hour. Once  
cooled the solution was mixed using a high sheer mixer  
(Ystral) for 1 min on setting 4.

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The solution was then returned to the heidolph and allowed  
to cool to room temperature with constant stirring. Once  
cool the CAPB and remaining SLES 2EO were added and mixed  
using the heidolph.

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To prepare solution 1 (no cholesterol) then there is no need for heating up the solution. The dequest was weighted into water and then, once dissolved the CAPB was added and mixed using the heidolph. Once dissolved the SLES 2E0 was added and returned to the heidolph.

### Step 2: Bleaching Method

The bleaching solutions 1 and 2 were each divided into three parts A, B and C. A was adjusted to pH 9.7, B to pH 10.1 and C to pH 10.5. Each solution was adjusted to the required pH with ammonium hydroxide (ex sigma, 28.1% active).

The six solutions were each dosed (1.6 ml/g hair) onto a separate Spanish hair switch (8g, 8", ex Hugo Royer Hair Suppliers) in a disposable petri dish using an automatic pipette. Each switch was then agitated for 90sec using a spoon ended plastic spatula. The switches were then left for 20 min. 1.6 ml/g hair of warm water was then pipetted onto each switch and they were agitated again for 1min. Each switch was then rinsed and left to dry naturally.

### Step 3: Cuticle Abrasion Method

This method provides a measure of the extent of hair damage following the bleaching step.

First the switches from step 2 were washed for 30sec with 0.1ml/g hair of base wash. Rinse and repeat. The base wash used is 12% SLES, 2% CAPB in water. Dry them overnight. Cut the hair about 1cm long throughout the whole length. Weight out 4g of the hair and place into the blender (Waring 11 commercial blender). Record the initial weight of the hair. Add 200ml of distilled water to the blender, making sure that the hair is covered with water. Blend hair in the water for 1 min. Transfer the liquid to a fresh tube. Wash the blender and add this, to the tube, as well. Pour the

supernatant in 4 x 50ml centrifuge tubes and centrifuge at 4300rpm for 10mins, 22°C. Pour the pellet on the filters, wash the tube and add this as well. Transfer the supernatant to centrifuge tubes and centrifuge at 4300rpm for 10 min.

- 5 Transfer the pellet to a beaker, wash the tube 2-3 times and top with water until 50ml. Freeze them until solid. Freeze dry them for 24 hours in Modulyo freeze drier. Once dry, weigh amount of cuticle recovered.

- 10 Final measure is calculated as follows:  

$$((\text{weight of cuticle recovered})/(\text{initial hair weight})) \times 100$$

- This measure provides the % weight of cuticle abraded from the hair fibres which reflects the state of damage of the hair tested. Thus the greater amount of cuticle recovered the more damaged the tested hair.
- 15

## RESULTS

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Table 1

| pH   | % Weight of cuticle recovered from hair bleached with solution 1 (cholesterol absent) | % Weight of cuticle recovered from hair bleached with solution 2 (cholesterol present) | % reduction in damage of hair when cholesterol present |
|------|---|--|--|
| 9.7  | 0.041   | 0.039  | 3.95   |
| 10.1 | 0.048   | 0.042  | 12.211   |
| 10.5 | 0.122   | 0.084  | 30.902   |

- 25 From the results in Table 1 is it clear that the presence of Cholesterol reduces the damage caused to hair by bleaching

since the % weight of cuticle recovered when Cholesterol is present is less than when Cholesterol is absent.

Surprisingly, however, the same amount of Cholesterol  
5 reduces the damage to hair by a significantly greater extent  
when the bleaching solution is buffered to a pH above 10  
than below pH 10. For example, it can be seen that at pH  
9.7 there is 3.95% less damage to the hair when Cholesterol  
is present, but surprisingly there is 30.902% less damage to  
10 the hair when the same amount of Cholesterol is present, but  
the bleaching solution is buffered to pH 10.5.

Thus we have surprisingly found that in a bleaching  
composition buffered to a pH above 10 cholesterol reduces  
15 hair damage to a greater extent than in a bleaching  
composition buffered to a pH below 10.

#### Example 2

#### 20 Hair Bleaching Composition

A hair bleaching composition was prepared in conventional  
manner according to the formulation details below. The  
developer and base were stored in separate bottles before  
25 use. To use, the developer and base are mixed together to  
form a hair bleaching composition according to the present  
invention, having a pH greater than pH10. The composition  
is applied to hair and left for 20 minutes. The hair is  
bleached effectively with minimal damage.

30



## Developer

| Material                          | % Active<br>Species | %w/t  | Amount (g) |
|-----------------------------------|---------------------|-------|------------|
| Lowenol 6559<br>(ex. Lowenstein)  | 100                 | 1.0   | 1.0        |
| Phosphoric Acid<br>(ex Sigma)     | 85                  | 0.03  | 0.03       |
| Hydrogen Peroxide<br>(ex. Fisher) | 35                  | 17.1  | 17.1       |
| Polyquaterium 37<br>(ex Ciba)     | 100                 | 1.0   | 1.0        |
| Water (DI)                        |                     |       | 80.87      |
|                                   |                     | Total | 100.00     |

Base

| Material                               | % Active | %w/w         | Amount (g) |
|--|----------|--------------|------------|
| EDTA (ex Sigma)                        | 100      | 0.6          | 0.6        |
| Sodium Sulphite<br>(ex Fisher)         | 100      | 1.0          | 1.0        |
| Sodium Isoascorbate<br>(ex Lowenstein) | 100      | 0.15         | 0.15       |
| Propylene Glycol<br>(ex Sigma)         | 100      | 8.4          | 8.4        |
| Lowenol C-243<br>(ex Lowenstein)       | 100      | 8.0          | 8.0        |
| Lowenol S-216X<br>(ex Lowenstein)      | 100      | 22.2         | 22.2       |
| Oleic Acid<br>(ex Aldrich)             | 100      | 8.6          | 8.6        |
| Isopropanol<br>(ex Sigma)              | 100      | 12.5         | 12.5       |
| Cholesterol<br>(ex Sigma)              | 100      | 0.3          | 0.3        |
| Ammonia<br>(ex Sigma)                  | 28       | 33           | 33         |
| Water (DI)                             |          |              | 5.25       |
|  |          | <b>Total</b> | 100.00     |

Example 3Hair Colouring Composition

- 5 A hair colouring composition was prepared in conventional manner according to the formulation details below. The developer and base were stored in separate bottles before use. To use, the developer and base are mixed together to form a hair colouring composition according to the present invention, having a pH greater than pH10. The composition is applied to hair and left for 20 minutes. The hair is coloured effectively with minimal damage.

## Developer

| Material                         | % AD | % w/w        | Amount (g) |
|----------------------------------|------|--------------|------------|
| Lowenol 6559<br>(ex Lowenstein)  | 100  | 1.0          | 1.0        |
| Phosphoric Acid<br>(ex Sigma)    | 85   | 0.03         | 0.03       |
| Hydrogen Peroxide<br>(ex Fisher) | 35   | 17.1         | 17.1       |
| Polyquaterium 37<br>(ex Ciba)    | 100  | 1.0          | 1.0        |
| Water (DI)                       |      |              | 80.87      |
|                                  |      | <b>Total</b> | 100.00     |

## Dye Base

| Material   | % AD       | % w/w        | Amount (g)         |
|--|------------|--------------|--------------------|
| EDTA (ex Sigma)  | 100        | 0.6          | 0.6                |
| Sodium Sulphite<br>(ex Fisher)   | 100        | 1.0          | 1.0                |
| Sodium Isoascorbate<br>(ex Lowenstein)   | 100        | 0.15         | 0.15               |
| Propylene Glycol<br>(ex Sigma)   | 100        | 8.4          | 8.4                |
| Lowenol C-243<br>(ex Lowenstein)   | 100        | 8.0          | 8.0                |
| Lowenol S-216X<br>(ex Lowenstein)  | 100        | 22.2         | 22.2               |
| Oleic acid<br>(ex Aldrich)   | 100        | 8.6          | 8.6                |
| Isopropanol<br>(ex Sigma)  | 100        | 12.5         | 12.5               |
| Cholesterol<br>(ex Sigma)  | 100        | 0.3          | 0.3                |
| Ammonia<br>(ex Sigma)  | 28         | 33.0         | 33.0               |
| RODOL DJ p-<br>phenylene-diamine<br>(Primary<br>Intermediate)<br>(ex Lowenstein) | 100<br>100 | 1.0<br>1.0   | 1.0<br>1.0<br>3.25 |
| RODOL RS resonanol<br>(Coupler)<br>(ex Lowenstein)                               |            |              |                    |
| Water (DI)   |            | <b>Total</b> | 100.00             |